Portability in the Signal Processing Subsystem

Government/Industry Workshop

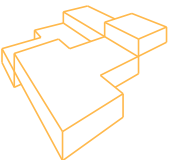## April 29, 2004

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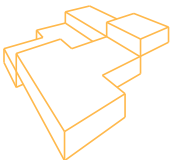*Engineered for life*

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What is the Problem?

- **SCA Achieves Portability Goals Using CORBA to Isolate Waveform Applications from Processor**
  - **Extendible to DSPs with some penalties**
  - **Not applicable to FPGAs**
- **High Performance Waveforms and Space Environment Drive Solutions to Use DSPs & FPGAs**
- **Different DSPs optimized for different processing functions**
  - **Fixed-point vs. Floating-point**
  - **Device-unique instruction sets**
  - **Limited availability of CORBA ORBs**
    - **Use of OS and CORBA makes for heavy-weight footprint**
- **FPGA Technology Not Suited for Small Form Fit Radios**
  - **Large Size; High Power Draw; Cannot Turn Off Device to Save Power**
 - **ASIC Best Low Power Solution; Not Software Reconfigurable**

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- **All Processing Elements Have Portable Waveform Software**
  - **Hardware Independent**
  - **Higher Order Language**
  - **Open Architecture Platforms Provide Standard Interfaces**
  - **Little or No Modification for Porting to New Platforms**

- **Platform / Waveform Constraints Affect the Balance**
  - **Robust and Complex Waveforms**
  - **Long Battery Life**
  - **Small Size**
  - **Radiation Environment**
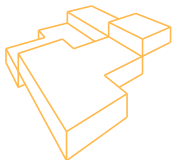
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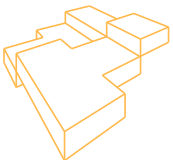
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Challenges of Attaining the Vision

- **Near-Term Challenges**
  - **Waveforms Still Hardware Specific (Modem)**
  - **Typical Hardware Technology Large and Power Hungary**
  - **Concerns Exist for Porting JPO Library Waveform Modem Code**
    - **Waveform Resource Utilization Untested**
      - **Risk moving forward with new designs**
      - **Low Power, Small Size Diminish Design Margin**
    - **Possible Limited use of Object-Oriented Design and Coding?**
    - **Standard Open Source Middleware Not Available for Porting**

- **Far-Term Challenges**
  - **Waveform Software Complexity Increasing, Requiring More Signal Processing Power**
  - **General Purpose Processors Increasing MIPS, Size and Power Consumption**
 - **Higher Order Languages and Representations Continually Evolving**

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- **Open Architecture Standards Within Modem**
  - **CORBA in DSP**
    - **Allow Migration of Processing from GPPs**
    - **Consider Less Than Full CORBA ORB/Naming Service/Event Service/Log Service**
  - **Hardware Abstraction Layer**
    - **Standardize on APIs for Significant Architectural Blocks**
      - **Signal Processing Functions**
      - **RF Interface and Control**
      - **BIT and Performance Monitoring**
    - **APIs Include Performance, Not Just Interface**
      - **Latency**
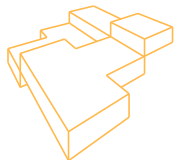   - **Throughput**
      - **Jitter**
      - **Precision**
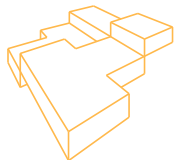
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- **Open Architecture Standards Within Modem**, cont'd
  - – **Focus on Waveform Definition, Not Implementation**
  - – **Every FPGA/ASIC Waveform Designer Provides**
    - **Block diagram or functional partitioning**
    - **RTL source code**
    - **Behavioral test benches on an Industry Standard Tool Set**
    - **Simulation tool, version, results and performance margins**
    - **Code coverage analysis statistics, if any**
    - **Technology dependent code, if any**
    - **Technology dependent IP cores, if any**
    - **Synthesis tool, version and implementation constraints**
    - **Place and Route tool, version and implementation constraints**
    - **Previously targeted device part number and logic utilization report**

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